Mapper Project Notes

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① Let $f: M \to \mathbb{R}$. We will create a covering of $\mathbb{R}$ will <u>pull-backs</u> of <u>regular</u> open coverings on another copy of $\mathbb{R}$ under some function $\varphi: \mathbb{R} \to \mathbb{R}$.

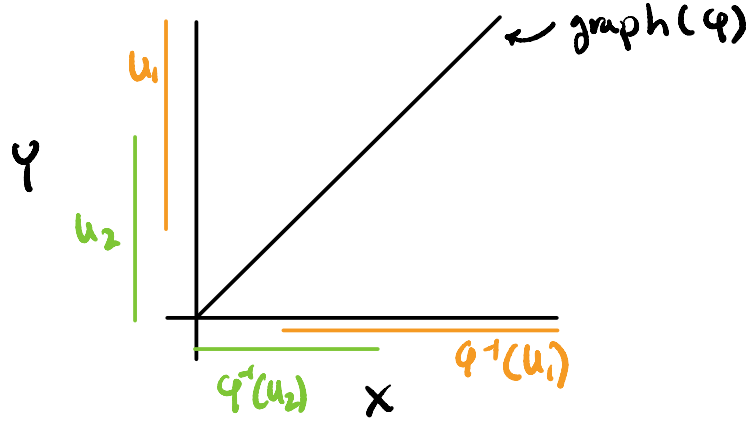
<u>Definitions</u>. Let $\mathcal{U}$ be an open cover of $Y = \mathbb{R}$, and let $\varphi: X \to Y$ be continuous when $X = \mathbb{R}$. We call the open cover

$$\varphi^{-1}(\mathcal{U}) = \{\varphi^{-1}(U) : U \in \mathcal{U}\}$$

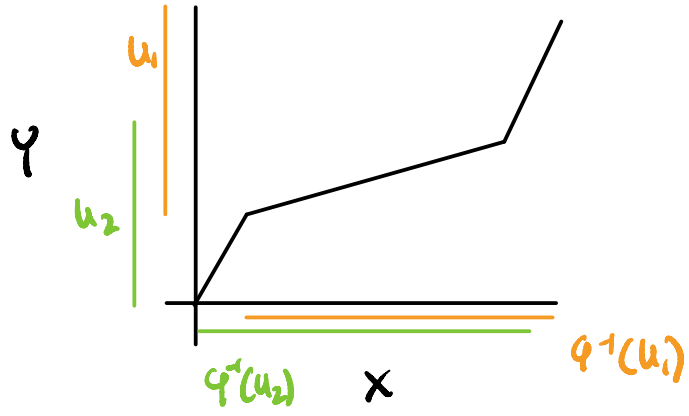
of X the pull-back of $\mathcal{U}$ under φ.

<u>Examples</u>.

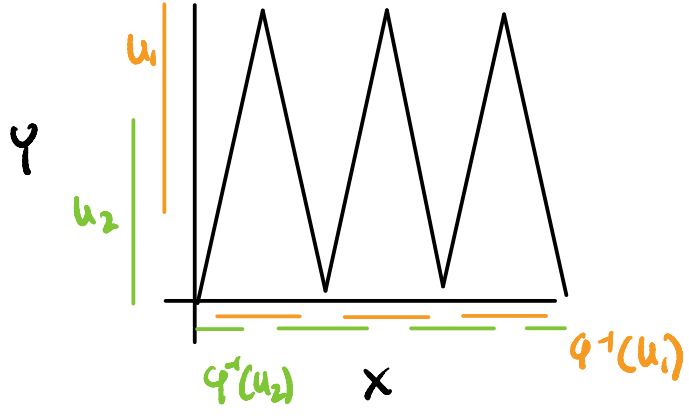
(a)



(b)



(c)



Facts. (a) $M(f, \varphi^{-1}(\mathcal{U})) = M(\varphi \circ f, \mathcal{U})$.

(b) If φ is a bijection, a "good" open cover $\mathcal{U}$ (one s.t. each $U \in \mathcal{U}$ is an open interval), then $\varphi^{-1}(\mathcal{U})$ is a good open cover of X.

Questions.
- Useful for optimization of covers?
- Given $\mathcal{U}$, what is the class of all $\varphi^{-1}(\mathcal{U})$ over all φ in some class?